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The Defense Technical Information Center (DTIC) provides information services to the Army, Navy, Air Force, other Department of Defense (DoD) agencies, other Government agencies, and Government contractors. In order to provide this information, DTIC needs to anticipate the information needs of its users. An understanding of the flow of scientific and technical information (STINFO) within DTIC user organizations is necessary to provide the best services. This paper was undertaken to trace the flow of STINFO within the Department of the Army's research laboratories and to determine how the Army researcher gathers information. Recommendations are made as to how DTIC can better serve the information needs of the Army.

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The Flow of Scientific and Technical Information in the US Army Research Laboratories

May 1985

Office of Information Systems and Technology
Defense Technical Information Center
Cameron Station, Alexandria, VA 22304-6145

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

The Defense Technical Information Center (DTIC) provides information services to the Army, Navy, Air Force, other Department of Defense (DoD) agencies, other Government agencies, and Government contractors. In order to provide this information, DTIC needs to anticipate the information needs of its users. An understanding of the flow of scientific and technical information (STINFO) within DTIC user organizations is necessary to provide the best services. This paper was undertaken to trace the flow of STINFO within the Department of the Army's research laboratories and to determine how the Army researcher gathers information. Recommendations are made as to how DTIC can better serve the information needs of the Army.

INTRODUCTION

The Department of the Army, with its many research laboratories, generates and uses vast amounts of scientific and technical information (STINFO). In any scientific endeavor, having the needed information readily available saves time and money. Management of STINFO is therefore an important part of research. This paper examines the Army's STINFO program and considers some of the problems in the current system.

The Army's official definition of STINFO is found in the Joint Chiefs of Staff's Dictionary of Military Terms:

> Information, including scientifc information, which relates to research, development, engineering, test, evaluation, production, operation, use and maintenance of munitions and other military supplies and equipment.[1]

A less formal definition, and one used by Jack Kolb, the Army's Principal Technical Information Officer (PTIO), is

> Anything generated by the Army Materiel Command laboratories; the Army Corps of Engineers laboratories; the Medical laboratories; or the personnel laboratories.[2]

Any definition of STINFO must include not only the concept of information generation, but also its control, access and use. None of the four concepts can stand alone; interaction with the other concepts is necessary. Reams of information can accumulate, but unless that information can be easily accessed in a usable form, the accumulation of it is pointless. The Army is constantly working to improve its STINFO system and to gain control of the new media in which information is appearing.

ORGANIZATION OF THE ARMY'S STINFO SYSTEM

Department of Defense (DoD) Directive 3200.12 requires the Deputy Chief of Staff for Research, Development, and Acquisition (DCSRDA) to

> designate a senior-level STI director or manager at the Military Department or Defense Agency staff level who shall represent and manage their STI programs and serve as a single, authoritative point of contact for STI matters.[3]

In the Army, this designatee is the Director of Army Research and Technology. He is the Army's scientific and technical information manager (STIM), responsible for implementing the Army's Scientific and Technical Information program (STIP) policy.

Army Regulation (AR) 70-45 implements DoD Directive 3200.12. It

> updates responsibilities, policies, and objectives for the Army's Scientific and Technical Information Program and retains the US Army Materiel Development Command as executive agent.[4]

The Commanding General of the Army Materiel Development Command (AMC) coordinates

> administration and execution of the STIP for all Army activities by ... designating a principle Army technical information officer (PTIO) ... and providing the consolidated 5-year STIP Plan.[5]

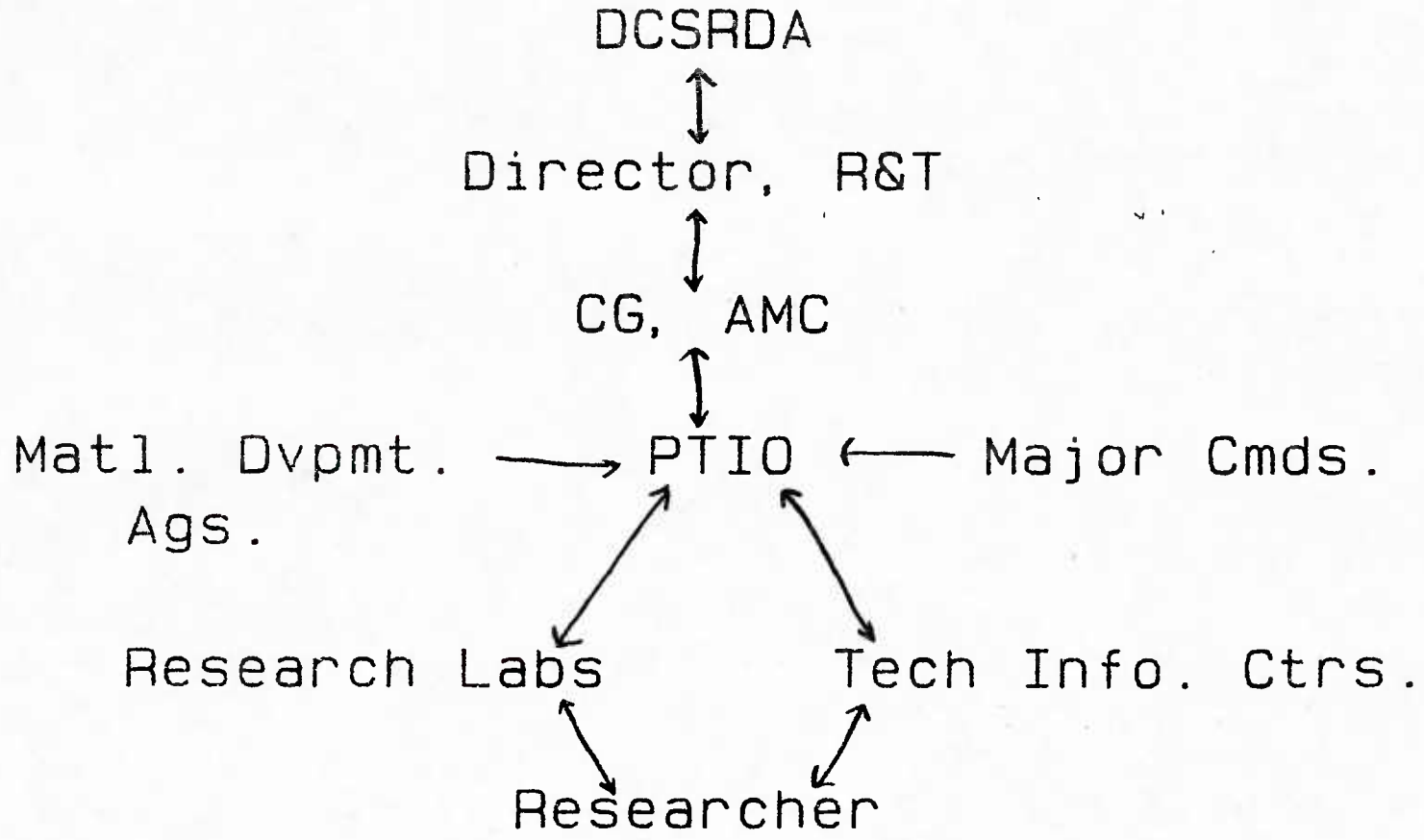
The Army's PTIO provides a central focus or coordination point for technical information management. As such, he is responsible for optimizing the information management in the 35 Army research laboratories and for the technical coordination of the Army's technical libraries.

The heads of the materiel developing agencies and of the major Army commands

> implement instructions and procedures issued by the PTIO ... and appoint an S&TI point of contact for each field activity to respond to the PTIO.[6]

In the laboratories this point of contact could be either a scientist or an administrative officer. The scientific and technical information (STI) point of contact in the technical information center is usually one of the librarians.

ARMY STINFO SYSTEM



ORGANIZATION OF ARMY RESEARCH AND TECHNOLOGY

The Army's Research and Technology element is divided into four parts:

1. The Army Materiel Command (twenty laboratories).
2. The Army Corps of Engineers (five laboratories).
3. The Surgeon General's Office (nine laboratories).
4. The Army Office of Personnel (one laboratory).

Each of these 35 laboratories is served by a technical information center or library. Some information centers serve more than one laboratory. A listing of the 35 laboratories and their locations can be found in Appendix A.

CHARACTERISTICS OF ARMY RESEARCHERS

Most Army researchers are civilian personnel, with the ratio of military to civilian varying with the command. The only statistics readily available were for the Army Research Institute (ARI). These were obtained from ARI's personnel office.

The Army researcher's educational background varies across the laboratories also, with a lower percentage of Ph.D.s among the engineers than among the scientists. The subject areas of expertise cover a wide range from aeronautics to zoology, but again the only statistics available were for the ARI.

Table 1 displays the ratio of civilian to military personnel in the ARI and the number of researchers who have Ph.D.s. Table 2 shows the subject backgrounds of the civilian ARI researchers.

TABLE 1

ARMY RESEARCH INSTITUTE PERSONNEL - FY 84

	AUTHORIZED*
CIVILIANS	374
OFFICERS	22
ENLISTED	13

* of the total, 211 are Scientist, 79% have Ph.D. degrees

TABLE 2

ARMY RESEARCH INSTITUTE PERSONNEL

SCIENTIFIC DISCIPLINE BY SPECIALITY - FY 84

EXPERIMENTAL PSYCHOLOGY	46
HUMAN FACTORS	47
TRAINING	39
INDUSTRIAL/ORGANIZATIONAL	19
PERSONNEL	25
QUANTITATIVE/MATH/STATS	9
COMPUTER SCIENCE/SPECIALIST	7
SOCIAL PSYCHOLOGY	4
OPERATIONS RESEARCH	6
EDUCATIONAL RESEARCH	7
ECONOMICS	4
SOCIOLOGY	1
ENGINEERING	2
OTHER	10

THE INFORMATION-SEEKING PROCESS

Information access has evolved rapidly in the last few years. Much faster and more pertinent access to information is now available through on-line data bases, either in-house or commercial; computerized bibliographic retrieval; electronic mail, etc. The problem has become not so much "Is the information available?" as "How do I get the information I need?"

The traditional means by which any scientist or engineer finds needed information is through:

1. Books
2. Journals
3. Other printed media, such as standards, specifications, manuals, technical reports.
4. Personal interactions--professional colleagues, telephoning or writing to authors of recent papers.
5. Professional meetings, symposia, briefings.

Much of the information the Army researcher needs will be found in the same way that his non-Army counterpart finds it. But the Army researcher will also have available to him some methods or resources that are not available to the non-Army researcher.

When an Army researcher needs information, his first step is to consult the resources immediately available to him: handbooks, journals, or other documentation located right in his laboratory. He may check his personal files, or ask his co-workers for help. If those methods do not produce the information he wants, he next asks the STI point of contact within the lab or the lab manager for assistance.

When the resources within the lab fail to produce the information the researcher wants, the next stop is the technical library or information center serving his laboratory. There, the options are wider. The

information center has a larger collection of books and journals than were available in the lab. There is also likely to be an extensive collection of technical reports. The researcher can browse the collection, search the printed indexes to periodicals, or check the card catalog. Or, more likely, he will ask the librarian to help him find the information he needs.

If the researcher needs an individual piece of information, such as a constant or a statistic, the librarian may consult the printed resources within the library. If that fails, or if the information needed is broader than a single fact, the librarian will probably use the computerized data bases available to the information center. Most Army research libraries have three major on-line systems available to them:

1. OCLC (Online Computer Library Center, Inc., Dublin, Ohio). This is an on-line union catalog of the holdings of libraries and information centers across the country. OCLC is particularly helpful when trying to locate a book needed on interlibrary loan. Or, if the book is to be purchased, OCLC can quickly produce the publishing information necessary for ordering.

2. DROLS (Defense RDT&E On-Line System). This data base is resident on DTIC's UNIVAC 1100/82 computer. DROLS contains information on DoD-supported scientific and technical research. Four files are available:

a. Technical Reports (TR) Data Base. This data base consists of the bibliographic records of DoD-related technical reports. Some of the records are input by members of the Shared Bibliographic Input Network (SBIN). SBIN is a shared technical report cataloging program. Participants, who are from DoD activities or DoD contractors, add their holdings to the data base. The SBIN records announce DoD-held reports not yet available from DTIC. When DTIC obtains copies of the technical reports, the records are changed to indicate that the technical reports are under DTIC computer control for secondary distribution on request.

b. Research and Technology Work Unit Information System (WUIS) Data Base. This is a data base of on-going DoD research and development efforts at the work unit level, the lowest level of reported research.

c. Independent Research and Development (IR&D) Data Base. This is a data base of contractor's independent R&D efforts shared with DoD. The data base is proprietary and available only to DoD offices, agencies and the services.

d. Research and Development Program Planning (R&DPP) Data Base. This data base contains planned R&D project and task level summaries. Input was discontinued as of January 1, 1983. However, the existing data base is still available, and a replacement is being developed.

DROLS users have the option of two access modes. DROLS is available either via a dedicated terminal with direct access to DROLS, or via a dial-up terminal with access through the telephone and a modem. The dedicated terminals may be either classified or unclassified. A user must have a secret facility clearance to qualify for a dedicated classified terminal, but not all facilities with a secret clearance have classified terminals. Cost and security considerations affect the choice of access.

3. DIALOG (DIALOG Information Services, Inc., Palo Alto, CA). This is a commercial data base vendor which allows on-line access to over 250 data bases covering a wide variety of subject areas. Some data bases have numerical information, others are bibliographic, or have marketing information.

Some libraries use data bases from BRS (Bibliographic Retrieval Services, Inc., Latham, NY) or ORBIT (SDC Search Service, Santa Monica, CA), both of which offer services similar to DIALOG. The three vendors offer many of the same data bases, but each vendor has data bases unique to its service. Information centers serving medical research laboratories use MEDLARS, the information system developed and offered by the National Library of Medicine. MEDLARS can also be accessed through DIALOG, BRS and ORBIT. A few libraries may have access to LEXIS, a legal and accounting data base marketed by Mead Data Central.

Not all of the Army researcher's information needs are one-time immediate requirements. To a researcher wanting to keep current in his field, a selective dissemination of information (SDI) profile is valuable. Vendors, such as DTIC and DIALOG offer an automated version of this service. The researcher can establish with the vendor a profile of particular subject areas in which he is interested. Each time the vendor updates the data base, the new additions will be run against the researcher's subject profile, and a bibliography of current accessions created. The bibliography is then sent to the researcher. As the researcher's needs or subject area change, the profile can be altered to continue providing pertinent current information. The SDI on the commercial data bases can be run either by the vendor (e.g., DIALOG) or by the librarian in the information center.

Professional meetings or symposia are another means of satisfying the information needs of the Army researchers. In terms of the quality of the information, meetings rank number one in importance.[7] The researcher has personal contact with people working in his subject area. He can speak with them, ask questions, and clarify points which are unclear. The information given at these meetings is presumably the most current, up-to-date information available.

Many professional societies offer frequent, regularly-scheduled meetings. The Army researchers attend them and present papers. The Army also sponsors symposia.

An Army symposium is offered when technology in a certain area has developed to a critical level. At this point, the Army laboratories involved in that research contact scientists or engineers who are working in the area. They may be from government, private industry, or academic laboratories across the country. These researchers are asked to submit manuscripts dealing with that particular technology, and present them at the symposium.

The purpose of the Army symposium is to share state-of-the-art information and to establish a plateau of accomplishment - a stepping stone to the future - at which scientists can later look back for comparison. The symposium represents the leading edge of technology at that time, and makes the technology available to researchers in laboratories outside the Army. This serves to stimulate more research, which will eventually return to benefit the Army.

DTIC Services Used By Army Research Laboratories

In addition to the DROLS data bases Army research laboratories use many other services offered by DTIC. These are:

1. Automatic Document Distribution (ADD) Program. Laboratories registered for this service automatically receive microfiche copies of newly accessioned scientific reports within their established fields of interest.

2. Current Awareness Bibliography (CAB). A registered user may establish a profile in one or more subject areas in which he is interested. Biweekly this profile is run against the newly-accessioned documents and the bibliography created is sent to the user.

3. Recurring Reports. Users establish a subject profile to be run against the Work Unit and IR&D files on a monthly, quarterly, semiannual or annual basis. Copies of the summaries are sent to the user each time the profile is run.

4. Technical Abstract Bulletin (TAB). This is a confidential biweekly publication announcing newly acccessioned classified and limited technical reports. It is distributed to authorized DTIC users.

5. Demand Bibliographies. Registered users may request retrospective bibliographies on specific fields of interest. These can be technical reports, work unit summaries or program planning summaries.

6. Magnetic Tapes. Bibliographies can also be prepared on magnetic tape rather than in print. The tapes can then be downloaded into the user's computer for manipulation. A fee is charged for magnetic tapes.

7. Demand Technical Reports. Users can request individual technical reports whenever the need arises. Many users prefer this method of obtaining reports to the ADD program.

Table 3 shows which of the Army research laboratories are registered DTIC users, and which services they use. Table 4 shows which laboratories have dedicated DROLS terminals, and which have dial-up access. A facility must have a secret clearance to have a dedicated DROLS terminal. However, because of cost and other considerations, not all facilities with secret clearances have dedicated terminals.

TABLE 3

ARMY RESEARCH LABORATORIES' USE OF DTIC SERVICES

	Registered with DTIC	Services Used TAB	CAB	ADD	Recurring Reports
US ARMY MATERIALS AND MECHANICS RESEARCH CENTER	X			X	
US ARMY RESEARCH OFFICE	X				
US ARMY HUMAN ENGINEERING LABORATORY	X	X			WU IR&D
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER	X	X	X	X	IR&D
BALLISTICS RESEARCH LABORATORY	X	X	X	X	
LARGE CALIBER WEAPONS SYSTEMS LABORATORY	*				
FIRE CONTROL & SMALL CALIBER WEAPONS SYSTEM LABORATORY	*				
CHEMICAL R&D CENTER	X	X	X	X	
US ARMY AVIATION SYSTEMS COMMAND	X	X	X		
US ARMY COMMUNICATIONS & ELECTRONICS COMMAND	X				
US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND	X	X		X	
COMBAT SURVEILLANCE AND TARGET ACQUISITION LABORATORY	*				
ELECTRONICS TECHNOLOGY AND DEVICES LABORATORY	*				
ATMOSPHERIC SCIENCES LABORATORY	X	X	X	X	WU
HARRY DIAMOND LABORATORIES	X	X			WU

* Not registered
WU Work Unit Summaries
IR&D Independent Research & Development

TABLE 3--Continued

	Registered with DTIC	Services TAB	CAB	ADD	Used Recurring Reports
NIGHT VISION AND ELECTRO-OPTICS LABORATORY	X	X	X		WU
SIGNALS WARFARE LABORATORY	X	X			
US ARMY BELVOIR R&D CENTER	X	X	X		WU IR&D
US ARMY NATICK R&D CENTER	X	X	X	X	
US ARMY MISSILE COMMAND	X	X	X	X	WU
US ARMY TANK AUTOMOTIVE COMMAND	X	X	X	X	
US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES	X		X	X	WU
US ARMY CONSTRUCTION ENGINEERING RESEARCH LABORATORY	X				
US ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY	X	X	X		
US ARMY ENGINEER TOPOGRAPHIC LABORATORY	X	X	X	X	
US ARMY WATERWAYS EXPERIMENT STATION	X	X	X	X	
US ARMY MEDICAL BIOENGINEERING RESEARCH AND DEVELOPMENT LABORATORY	X				
US ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES	X				
US ARMY AEROMEDICAL RESEARCH LABORATORY	X			X	
WALTER REED ARMY INSTITUTE OF RESEARCH	X				
US ARMY INSTITUTE OF SURGICAL RESEARCH	*				

* Not registered
WU Work Unit Summaries
IR&D Independent Research & Development

TABLE 3--Continued

	Registered with DTIC	Services Used TAB	CAB	ADD	Recurring Reports
US ARMY INSTITUTE OF DENTAL RESEARCH	*				
US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE	*				
LETTERMAN ARMY INSTITUTE OF RESEARCH	X	X			
US ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	X		X		

* Not registered
WU Work Unit Summaries
IR&D Independent Research & Development

Table 4

ARMY RESEARCH LABORATORIES DROLS ACCESS

	DROLS ACCESS Dedicated	Dial-up
US ARMY MATERIALS AND MECHANICS RESEARCH CENTER	S	
US ARMY RESEARCH OFFICE		X
US ARMY HUMAN ENGINEERING LABORATORY		X
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER	S	
BALLISTICS RESEARCH LABORATORY	S	X
LARGE CALIBER WEAPONS SYSTEMS LABORATORY		
FIRE CONTROL & SMALL CALIBER WEAPONS SYSTEM LABORATORY		
CHEMICAL R & D CENTER	S	
US ARMY AVIATION SYSTEMS COMMAND		X
US ARMY COMMUNICATIONS & ELECTRONICS COMMAND		X
US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND	S	
COMBAT SURVEILLANCE AND TARGET ACQUISITION LAB		
ELECTRONICS TECHNOLOGY AND DEVICES LAB		
ATMOSPHERIC SCIENCES LAB	S	
HARRY DIAMOND LABORATORIES	S	
NIGHT VISION AND ELECTRO-OPTICS LABORATORY		X
SIGNALS WARFARE LABORATORY		
US ARMY BELVOIR R&D CENTER	S	
US ARMY NATICK R&D CENTER	S	
US ARMY MISSILE COMMAND	S	

S= Secret
U= Unclassified

Table 4--Continued

	DROLS ACCESS	
	Dedicated	Dial-up
US ARMY TANK AUTOMOTIVE COMMAND	U	
US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES		X
US ARMY CONSTRUCTION ENGINEERING RESEARCH LABORATORY		X
US ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY		
US ARMY ENGINEER TOPOGRAPHIC LABORATORY		X
US ARMY WATERWAYS EXPERIMENT STATION	U	
US ARMY MEDICAL BIOENGINEERING RESEARCH AND DEVELOPMENT LABORATORY		X
US ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES		X
US ARMY AEROMEDICAL RESEARCH LABORATORY		X
WALTER REED ARMY INSTITUTE OF RESEARCH		
US ARMY INSTITUTE OF SURGICAL RESEARCH		
US ARMY INSTITUTE OF DENTAL RESEARCH		
US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE		
LETTERMAN ARMY INSTITUTE OF RESEARCH		X
MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE		

S= Secret
U= Unclassified

RESOURCES AVAILABLE TO ARMY RESEARCHERS WHICH ARE NOT AVAILABLE TO OTHERS

In addition to the conventional means of finding STINFO, the Army researcher has available to him some resources to which his non-Army counterparts do not have access:

1. Internal publications. These are probably the most numerous of the special resources. Memos, electronic mail, briefings, laboratory notebooks and technical data notes are all forms of information which seldom go outside the laboratory, and do not reach the civilian scientific community.

2. Classified or limited technical reports. The general public and a large part of the industrial and academic research community have access to only the unclassified, unlimited technical reports generated by the DoD and its contractors. Some contractors have facility clearances for classified documents, but their access may still be restricted to certain subject areas. The Army researcher, however, can have access to all DTIC-held reports, and to those Army reports which have not been sent to DTIC. Since the information in these closely-held or classified reports is critical, the Army researcher has available to him the ultimate research results.

3. The IR&D database. This database describes current industrial research projects which may have future applications to DoD contracts. The file contains private industry proprietary information and is available only to DoD orgainizations.

4. The Technical Experts File. This file is compiled by the Army's PTIO. He sends to each Army laboratory the DoD's list of technologies considered critical or important. The laboratories are asked to submit the names of experts who could serve as advisors in those technologies. From the lists

sent by the 35 Army laboratories, the PTIO selects one Army expert for each technology. This person acts as the Army's spokesman or consultant. The technical experts file is not classified but "closely held."[8] It is currently in print form, but may soon be computer accessable.

5. Army Information Analysis Centers. The Army information analysis centers (IACs) function in much the same manner as those operated by other areas of the Defense Department. The Army maintains seven information analysis centers. Each IAC collects, reviews, analyzes, appraises, summarizes, and stores available information on subjects in highly specialized technical areas. The analyzed information is then repackaged and disseminated. The analyses are available to DoD and other government organizations, government contractors, and the private sector to the extent practicable without impairment to national security. IAC reports are announced by DTIC but may be available from DTIC, NTIS or the IAC itself. Because much of the information generated by the Army IACs is sensitive, the Army researcher has available to him critical analyses to which non-Army researchers may not have access. See Appexdix B for a list and description of the Army IACs.

THE GENERATION OF STINFO

In using STINFO, the Army laboratories also constantly generate it. In any research project, day-to-day findings are recorded, briefings are held, and reports are written. Some of this STINFO is for internal use only, some is prepared for Army or DoD distribution, and some is made available to the public.

Types of STINFO Generated

1. For laboratory internal use only:

A. Laboratory notebooks. Each researcher maintains a laboratory notebook for each project he is working on. The inclusion requirements are strict, and the notebook stands as the definitive day-to-day progress of a project. Access to the notebooks is tightly controlled and when finished, they are stored within the laboratory.

B. Technical data notes. Technical data notes are one-page summaries of an individual aspect of a project, such as a piece of equipment which was specially developed for the project, or a special adaptation of the piece of equipment. These notes are prepared by the bench-level scientists working on the project in the laboratory. The notes may have different titles in various laboratories. They are distributed only to a "fraternity list" of people whom the author knows would be interested in the piece of work.

C. Briefings. Periodically, briefings are held within each laboratory. The researchers present progress reports on current projects. Much of the material may be presented in the form of an oral discussion or lecture. There may also be charts, graphs, diagrams or other visual descriptions. These may

be displayed on paper or by other means such as overhead projection, slides, etc.

D. Electronic mail. At this point, most of the information exchanged by electronic mail is general correspondence. Eventually, however, Army researchers may be exchanging pertinent STINFO by this method.

E. Telephone conversations.

F. Other verbal communications. These may include informal brainstorming or consultation with colleagues in the lab.

G. Letters.

H. Technical expertise. Researchers acquire this gradually, over their working careers. It is usually stored only in the researcher's mind. Technical expertise is often available only to the person holding it, unless the release of it is triggered by some means, such as by direct questioning.

2. For DoD only:

A. Organizational charts of the individual research laboratories or groups of laboratories. (One laboratory may have multiple parts or laboratories within it). There are 35 organizational charts representing research laboratories in the Army. Each chart is prepared by its laboratory staff. There is no mandate as to how the charts should be prepared.

B. DoD In-House RDT&E Activities. These are one-page annual reports of work-in-progress. Each laboratory prepares its own report. There is a push within the Army to get these reports classified.

C. The annual posture report. Each AMC technical laboratory submits one. The posture report is a health-of-the-lab summary of the laboratory's accomplishments, or a report on certain facets of the laboratory. A few of these are submitted to DTIC, accessioned and announced.

3. For Army, DoD or public distribution:

A. Technical Reports. The Army labs must fulfill the same requirements as contractors in filing technical reports periodically through the course of a research project, and at its conclusion.

B. Proceedings of symposia. AR 70-45 requires that proceedings of Army-sponsored sysmposia be filed with DTIC.

C. The Work Unit Summaries generated at the laboratories. Each work unit summary represents the smallest research effort that can be defined, although at the operational level it may be further divided into subunits. The work unit summaries are also known as DD 1498s.

D. Laboratory technology assessments. These are prepared by scientists in the laboratories who have developed a technology which could be transferred outside the Army. The assessments are descriptions of non-patented technology which the taxpayers have supported and from which they can benefit. The assessments are sent to the Department of Commerce, and are published by The Center for the Utilization of Federal Technology (CUFT) in the annual Federal Technology Catalog (year): Summaries of Practical Technology. (CUFT was established as part of the National Technical Information Service (NTIS) in the Department of Commerce in response to the Stevenson-Wydler Technology Information Act of 1980 (PL96-480). Publication of the CUFT catalog is required by the law.)

ARMY RESEARCH LABORATORIES' INPUT TO DTIC

Army research laboratories submit to DTIC work unit summaries (DD 1498s) of on-going projects. They also file technical reports on completed research, and on projects still in progress. These submissions are entered into DTIC's data bases, and are made available to others in the DoD community.

Table 5 details the number of technical reports the Army research laboratories have submitted to DTIC since 1980, both for in-house research and for sponored research done by contractors. Table 6 shows the number of active work unit summaries each Army research laboratory has listed in DTIC's Work Unit Data Base.

Table 5

ARMY RESEARCH LABORATORIES SUBMISSIONS TO DTIC - TECHNICAL REPORTS

	Technical Reports					
	1980	1981	1982	1983	1984	1985*
US ARMY MATERIALS AND MECHANICS RESEARCH CENTER	25	23	34	49	24	0
US ARMY RESEARCH OFFICE	4	8	3	4	5	0
US ARMY HUMAN ENGINEERING LABORATORY	44	22	26	23	20	1
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER	348	398	351	372	346	21
BALLISTICS RESEARCH LABORATORY	6	2	4	3	86	13
LARGE CALIBER WEAPONS SYSTEMS LABORATORY	88	123	94	105	81	5
FIRE CONTROL & SMALL CALIBER WEAPONS SYSTEM LABORATORY	22	38	36	25	36	2
CHEMICAL R&D CENTER	0	0	0	0	0	0
US ARMY AVIATION SYSTEMS COMMAND	0	0	0	1	9	0
US ARMY COMMUNICATIONS & ELECTRONICS COMMAND	6	6	15	14	23	0
US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND	58	45	42	25	19	1

* As of 4 Apr 85
X No source code assigned

Table 5--Continued

	Technical Reports					
	1980	1981	1982	1983	1984	1985*
COMBAT SURVEILLANCE AND TARGET ACQUISITION LABORATORY	X	X	X	X	X	X
ELECTRONICS TECHNOLOGY AND DEVICES LABORATORY	X	X	X	X	X	X
ATMOSPHERIC SCIENCES LABORATORY	19	8	9	0	0	0
HARRY DIAMOND LABORATORIES	79	77	65	64	51	0
NIGHT VISION AND ELECTRO-OPTICS LABORATORY	24	14	10	19	11	6
SIGNALS WARFARE LABORATORY	12	1	7	2	6	0
US ARMY BELVOIR R&D CENTER	49	30	42	29	15	0
US ARMY NATICK R&D CENTER	28	27	41	33	34	0
US ARMY MISSILE COMMAND	180	162	124	129	102	4
US ARMY TANK AUTOMOTIVE COMMAND	30	18	20	11	16	0
US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES	70	73	30	44	39	1
US ARMY CONSTRUCTION ENGINEERING RESEARCH LABORATORY	50	58	66	56	76	1
US ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY	105	76	80	77	57	0

* As of 4 Apr 85
X No source code assigned

Table 5--Continued

	Technical Reports					
	1980	1981	1982	1983	1984	1985*
US ARMY ENGINEER TOPOGRAPHIC LABORATORY	27	30	32	29	20	0
US ARMY WATERWAYS EXPERIMENT STATION	165	228	207	215	182	0
US ARMY MEDICAL BIOENGINEERING RESEARCH AND DEVELOPMENT LABORATORY	22	19	11	15	14	0
US ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES	75	67	43	38	53	0
US ARMY AEROMEDICAL RESEARCH LABORATORY	5	7	19	11	11	0
WALTER REED ARMY INSTITUTE OF RESEARCH	107	98	100	125	149	0
US ARMY INSTITUTE OF SURGICAL RESEARCH	16	11	11	11	9	0
US ARMY INSTITUTE OF DENTAL RESEARCH	28	25	16	12	10	0
US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE	27	34	45	64	56	0
LETTERMAN ARMY INSTITUTE OF RESEARCH	37	58	57	47	3	2
US ARMY MEDICAL RESEARCH INSTITUTE OF CHEMICAL DEFENSE	0	3	7	9	7	0

* As of 4 Apr 85
X No source code assigned

Table 6

ARMY RESEARCH LABORATORIES SUBMISSIONS TO DTIC - WORK UNIT SUMMARIES

	ACTIVE WORK UNIT SUMMARIES*
US ARMY MATERIALS AND MECHANICS RESEARCH CENTER	205
US ARMY RESEARCH OFFICE	1,159
US ARMY HUMAN ENGINEERING LABORATORY	32
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER	379
BALLISTICS RESEARCH LABORATORY	196
LARGE CALIBER WEAPONS SYSTEMS LABORATORY	9
FIRE CONTROL & SMALL CALIBER WEAPONS SYSTEM LABORATORY	36
CHEMICAL R&D CENTER	108
US ARMY AVIATION SYSTEMS COMMAND	222
US ARMY COMMUNICATIONS & ELECTRONICS COMMAND	558
US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND	487
COMBAT SURVEILLANCE AND TARGET ACQUISITION LABORATORY	16
ELECTRONICS TECHNOLOGY AND DEVICES LABORATORY	130
ATMOSPHERIC SCIENCES LABORATORY	89
HARRY DIAMOND LABORATORIES	76
NIGHT VISION AND ELECTRO-OPTICS LABORATORY	130
SIGNALS WARFARE LABORATORY	13
US ARMY BELVOIR R&D CENTER	149
US ARMY NATICK R&D CENTER	160
US ARMY MISSILE COMMAND	322
US ARMY TANK AUTOMOTIVE COMMAND	67

*As of 28 February 1985

Table 6 - Continued

	ACTIVE WORK UNIT SUMMARIES
US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES	145
US ARMY CONSTRUCTION ENGINEERING RESEARCH LABORATORY	95
US ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY	64
US ARMY ENGINEER TOPOGRAPHIC LABORATORY	99
US ARMY WATERWAYS EXPERIMENT STATION	95
ARMY MEDICAL R&D COMMAND	988
- US ARMY MEDICAL BIOENGINEERING RESEARCH AND DEVELOPMENT LABORATORY	
- US ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES	
- US ARMY AEROMEDICAL RESEARCH LABORATORY	
- WALTER REED ARMY INSTITUTE OF RESEARCH	
- US ARMY INSTITUTE OF SURGICAL RESEARCH	
- US ARMY INSTITUTE OF DENTAL RESEARCH	
- US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE	
- LETTERMAN ARMY INSTITUTE OF RESEARCH	

*As of 28 February 1985

PROBLEMS IN INFORMATION ACCESS

The form in which STINFO is stored and delivered has an effect on the considered importance and use of the information. The Army researcher shares many access problems with his non-Army counterparts.

FORMS OF STINFO

1. Books. Books, in the scientific and technical fields, are used mostly for background or historical research. The information within them is usually outdated by the time they are published.

2. Scientific journals. Journals are more current than books, but there may be a one to two year lag time between the conclusion of the research and publication of the article.

Both of the above appear, and are used, mainly in printed form.

3. Technical reports. Technical reports are generated mostly by government sources, whether the work is done in-house or under contract. Army researchers may also have access to non-government technical reports, such as those produced by private industry. Reports privately generated may be submitted to DTIC even if they are not DoD sponsored, as long as they are DoD related, and have had a limitation statement assigned by the originator. Some Army researchers think the technical reports are more current than the journal literature, because the reports are published not only at the conclusion of a research project, but also throughout the course of the

project.[9] An Army study, however, found that as much as four years passed between the time an open literature report on a research project was published and the technical report corresponding to it was filed. The Army thought the problem was severe enough that it allowed, as part of AR 70-45, substitution of a published journal article for the technical report.

The Army seems to comply with the requirements to write technical reports for research projects. However, there are some laboratories which either do not write reports or do not submit them to DTIC. The primary reason for the nonsubmission of reports to DTIC is that the laboratories feel the information is too sensitive to be further distributed. Thus, the reports are available to only a tight circle of researchers. There is no way to enforce the regulations for report submission.

The proceedings of Army symposia also become technical reports. There is a system for ensuring that this information is made available. During Inspector General (IG) audits, each laboratory is checked for compliance with all guidelines and regulations. The laboratories must exhibit proof of submission for each symposium offered. If the laboratory cannot submit proof, the IG notifies the PTIO and the sponsor of the symposium. The PTIO first determines if the IG's report is correct, then he contacts the sponsor to ensure the proceedings are submitted.

4. Standards, specifications, and manuals. These may be either military or industry related.

The technical reports, standards, specifications and manuals may appear either in paper copy or in microform. Army use of microfiche copies is

increasing slightly, but this is due more to the information centers' cost and space considerations than to increased user acceptance.

5. Computerized (online data bases). This information might be displayed on a cathode ray tube (CRT) screen or on the commonly-used heat-sensitive paper. Therefore, the display is often not a permanent record.

6. Computer software. Many software programs are being used in the laboratories to facilitate handling of data generated. Examples of these are SAS, BASIS DBMS, Manage DBMS, System 2000 DBMS and INQUIRE DBMS.

7. Verbal. This includes briefings, lectures, telephone conversations, talks over lunch, etc. This type of information can often only be recalled by the people directly involved.

8. Audio tapes. Recordings of lectures, training courses, etc. are often used to relay information to those who were not able to attend the presentations in person.

9. Visual. This includes video recordings, drawings, photographs and slides.

The last four forms create problems with access, storage, bibliographic control, and reproduction. These, along with the technical data notes, laboratory notebooks, electronic mail, briefings, correspondence, telephone calls and technical expertise, seldom get into the Army STINFO system at all. Therefore, the information is virtually unavailable to most researchers, even to many in the Army itself.

PROBLEMS WITH THE ARMY'S STINFO SYSTEM

The biggest problem with the Army's STINFO system is that there is no consistency in how the system is carried out within the various commands or laboratories. Each of the commands functions autonomously. The importance of STINFO and the information centers varies with the Commander. Each command also has its own sponsorship of STINFO. The flexibility and competence of the laboratory STINFO process varies with the position of the information center within the organizational structure of the command, and with the staff in each center. Some information centers answer directly to the Commander or Deputy Commander. Others answer to the head of management services or other support services.

The information center's location in the organization also affects its budget process, and budgeting is critical to the caliber of the information services. An information center may be either a direct line item in the command's budget or part of the command's overhead items. Information centers which are direct line items tend to have more support and be more secure than those budgeted as part of overhead, which have to compete with such services as heat and electricity.

The formal STINFO system as established by regulation, and as discussed earlier in the paper, does not work exactly as designed. The actual flow of STINFO and the responsiblilities of people at the various levels is more informal than it would appear. Designations of STINFO points of contact within the laboratories are either non-existent or lax. Most of the researchers either try to find needed information themselves, or they go directly to the librarian serving the laboratory. The information centers are more likely to have a designated STI point of contact than are the laboratories.

RECOMMENDATIONS

There are several ways DTIC could improve the flow of STINFO to the Army researcher:

1. Increase the Army researcher's awareness of DTIC products and services. Even though most of the researchers and librarians interviewed were aware of DTIC as a source of information, the population surveyed was probably a biased one. All of the people interviewed were extensive users of all types and sources of information. However, there are certainly many people in the Army research community who are not aware of all that DTIC can do for them in meeting their information needs. The usage charts presented in this paper seem to bear this out. Table 5 shows that DROLS and TAB are the most-used DTIC products, with Recurring Reports the least used. Some laboratories have multiple users of each service, others have only one profile established. Therefore, DTIC should make an effort to increase the Army researcher's awareness and usage of DTIC's products and services. There are several options for accomplishing this.

One means might be to increase the technical librarian's understanding of what DTIC has to offer and how DTIC's services can make the information-seeking process easier for both the librarian and the researcher. Another way of increasing the researcher's awareness of DTIC's services would be to have a DTIC representative meet with the designated STI points of contact or laboratory managers within the laboratories to discuss which DTIC services would best meet each laboratory's needs. The STI point of contact and the technical librarian could then assist the researcher in making better use of DTIC.

Another possibility might be to include either a written description of DTIC or a visual presentation of DTIC services at each new personnel orientation in the laboratories. DTIC has a video describing its services. Six copies can be loaned to anyone who is interested. However, the video is several years old and needs updating. DTIC might want to consider giving a copy of the updated video to each laboratory on permanent loan. It could be shown, if not at each orientation, at least several times per year.

2. Improve compliance of submissions for technical reports and work units. The more information coming into DTIC, the more information can go out. In this paper, Table 5 shows the number of technical reports submitted to DTIC by each research laboratory in the last five years. It appears that there has been a steady decline in the number of reports received by DTIC. DTIC needs to determine if this apparent decrease in submissions is due to noncompliance with regulations, or if there are other causes.

If the decline is due to non-compliance, the problem could originate with the researcher not writing the reports. Or there may be a laboratory policy controlling what information can leave the laboratory. Many laboratories feel the technical information they generate is too sensitive to be further distributed. The laboratories may also have decided to submit fewer reports for each long-term research project; for instance, they may be submitting only annual or semiannual reports instead of quarterly ones, figuring writing the reports takes too much time which could be better spent in the research itself. As previously mentioned, there has been as much as a 4-year lag between the time an open literature paper on a research project has been published and the technical report is filed with DTIC. In order for STINFO

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to be most valuable, it must be timely. Since the Army is now accepting journal articles in place of technical reports, this might be an avenue which DTIC's acquisition section could pursue in cases where technical reports have not been filed. The DoD Inspector General conducted a study in 1983 to examine the problem of non-submission of reports. The problem appears to be DoD wide and needs to be dealt with at that level. However, support from key DTIC and Army personnel could facilitate resolution of the problem.

DTIC might also ask non-government sponsors of symposia which are of significant interest to DoD or at which Army researchers present papers to submit proceedings or pertinent sections of the proceedings to DTIC for inclusion in the Technical Reports Data Base.

3. Maintain an active liaison who can meet regularly with Army representatives. This person would enter the Army's STINFO system near the top of the organizational chart. He would be involved more with policy, procedures or plans than with marketing individual products or services.

DTIC has several committees on which Army representatives sit, and some DoD committees have DTIC personnel as members. There are several DTIC employees who either serve on these committees or are involved with various Army information projects. However, these activities are not a major part of their job responsibilities. It would be advisable for DTIC to have an employee who has this liaison activity as part of the assigned job responsibilities. This would allow more continuity in the interface between the Army and DTIC. It would also give the Army a single point of contact for any problems or projects they may have. DTIC's office of User Services directorate would be the obvious area in which to place the liaison.

4. Work with the Army in anticipating future media. New media will present problems in access, control, duplication and distribution. Until recently, most STINFO was in the traditional print form. In the past few years, however, STINFO is appearing in alternate media - video, audio, graphics, computer software, etc. The Army is aware that an increasing amount of information is appearing in these media. A joint effort between DTIC and the Army would allow the Army to gain control of this information and put it to use.

BENEFITS TO DTIC

DTIC's mission includes directives to provide centralized operation for the acquisition, storage, retrieval, and dissemination of STI and to apply advanced techniques for developing improvements in services. The recommendations outlined will aid DTIC in its mission.

Increasing the Army researcher's awareness of DTIC's products and services will make DTIC more visible to the researcher. By being more visible, the researcher will be more likely to use DTIC as a resource. If the researcher makes greater use of DTIC's products and services, he will hopefully appreciate the value of DTIC as a STINFO information resource. Therefore, he may be more likely to write and submit his technical reports, so as to make the results of his own work available to others. This will make DTIC's collection more complete, and allow us to provide better service to the Army.

Maintaining an active liaison with the Army will help DTIC to anticipate the Army's STINFO needs more accurately. This will allow DTIC to direct its own resources better in allocating personnel and funds in future projects. All of these methods will help DTIC to provide not only better service to the Army, but they will also carry over into better service to other users.

DTIC would benefit from an examination of the flow of STINFO in the other services, the Navy and Air Force, as well as the non-service DoD components. The findings from this project could be used as a basis for initiating further studies.

Appendix A

ARMY RESEARCH LABORATORIES

US ARMY MATERIALS AND MECHANICS RESEARCH CENTER
Watertown, MA

US ARMY RESEARCH OFFICE
Research Triangle Park, NC

US ARMY HUMAN ENGINEERING LABORATORY
Aberdeen Proving Ground, MD

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER
Dover, NJ

BALLISTICS RESEARCH LABORATORY
Aberdeen Proving Ground, MD

LARGE CALIBER WEAPONS SYSTEMS LABORATORY
Dover, NJ

FIRE CONTROL & SMALL CALIBER WEAPONS SYSTEM LABORATORY
Dover, NJ

CHEMICAL R&D CENTER
Aberdeen Proving Ground, MD

US ARMY AVIATION SYSTEMS COMMAND
St Louis, MO

US ARMY COMMUNICATIONS & ELECTRONICS COMMAND
Fort Monmouth, NJ

US ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND
Fort Monmouth, NJ

COMBAT SURVEILLANCE AND TARGET ACQUISITION LABORATORY
Fort Monmouth, NJ

ELECTRONICS TECHNOLOGY AND DEVICES LABORATORY
Fort Monmouth, NJ

ATMOSPHERIC SCIENCES LABORATORY
White Sands Missile Range, NM

HARRY DIAMOND LABORATORIES
Adelphi, MD

NIGHT VISION AND ELECTRO-OPTICS LABORATORY
Fort Belvoir, VA

SIGNALS WARFARE LABORATORY
Warrenton, VA

US ARMY BELVOIR R&D CENTER
Fort Belvoir, VA

US ARMY NATICK R&D CENTER
Natick, MA

US ARMY MISSILE COMMAND
Redstone Arsenal, AL

US ARMY TANK AUTOMOTIVE COMMAND
Warren, MI

Army Office of Personnel

US ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
Alexandria, VA

Army Corps of Engineers

US ARMY CONSTRUCTION ENGINEERING RESEARCH LABORATORY
Champaign IL.

US ARMY COLD REGIONS RESEARCH AND ENGINEERING LABORATORY
Hanover, NH

US ARMY ENGINEER TOPOGRAPHIC LABORATORY
Fort Belvoir, VA

US ARMY WATERWAYS EXPERIMENT STATION
Vicksburg, MS

Office of the Surgeon General

US ARMY MEDICAL BIOENGINEERING RESEARCH AND DEVELOPMENT LABORATORY
Ft. Detrick
Frederick, MD

US ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES
Fort Detrick
Frederick, MD

US ARMY AEROMEDICAL RESEARCH LABORATORY
Ft. Rucker, AL

WALTER REED ARMY INSTITUTE OF RESEARCH
Washington, DC

US ARMY INSTITUTE OF SURGICAL RESEARCH
Forth Sam Houston, TX

US ARMY INSTITUTE OF DENTAL RESEARCH
Washington, DC

US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE
Natick, MA

LETTERMAN ARMY INSTITUTE OF RESEARCH
Presidio of San Francisco, CA

Appendix B

ARMY INFORMATION ANALYSIS CENTERS

1. Coastal Engineers Information Analysis Center (CEIAC). Vicksburg, MS. Subject coverage: engineering, coastal regions, beaches, erosion, ecology, environments, oceanography, ocean waves, tides, estuaries, inlets, hydrodynamics.

2. Cold Regions Science and Technology Information Analysis Center (CRSTIAC). Hanover, NH. Subject coverage: cold regions science and technology, the design, construction and maintenance of military facilities in cold regions and the conduct of snow, ice and frozen ground investigations.

3. Concrete Technology Information Analysis Center (CTIAC). Vicksburg, MS. Subject coverage: concrete, reinforced concrete, reinforcing materials, cements, mixtures, construction materials, aging of materials, loads (force), fracture mechanics, deformation, degradation, chemical analysis, repair, evaluation, maintenance, rehabilitation.

4. Hydraulic Engineering Information Analysis Center (HEIAC). Vicksburg, MS. Subject coverage: river, harbor, and tidal hydraulics; flow-through pipes, conduits, channels, and spillways as related to flood control and navigation; hydraulic design and performance of dams, locks, channels, and other structures; underwater shock effects.

5. Plastics Technical Evaluation Center (PLASTECS). Dover, NJ. Subject coverage: plastics, adhesives, and organic matrix composites, with emphasis on properties and performance; structural, electrical, electronic and packaging applications; molded, formed, foamed and laminated materials.

6. Pavements and Soils Trafficability Information Analysis Center (PSTIAC). Vicksburg, MS. Subject coverage: Pavements, trafficability, vehicle mobility, and terrain, as relevant primarily to military needs. Specific areas of road vehicle mobility, soil trafficability, ground flotation, and terrain evalutation.

7. Soil Mechanics Information Analysis Center (SMIAC). Vicksburg, MS. Subject coverage: soil mechanics, engineering geology, rock mechanics, soil dynamics, earthquake engineering, earth and rockfill dams, levees, earth retaining structures and building foundations, and laboratory testing of soils and rocks.

NOTES

1. Joint Chiefs of Staff, Department of Defense Dictionary of Military and Associated Term (Incorporating the NATO and IADB Dictionaries), 1 April 1984, p. 367

2. Interview with Jack Kolb, Army Principal Technical Information Officer, Army Materiel Command, Alexandria, VA, 14 January 1985.

3. US Department of Defense, DoD Directive 3200.12, DoD Scientific and Technical Information Program, Enclosure 2, Section 2a, 15 February 1983.

4. US Department of the Army, Army Regulation 70-45, Research, Development, and Acquisition. Scientific and Technical Information Program, p. 1, 1 February 1984.

5. Ibid., p. 11.

6. Ibid., p. 12.

7. Interview with Joe Soln, Harry Diamond Laboratories, White Oak, MD, 6 March 1985.

8. Interview with Jack Kolb, 14 January 1985.

9. Interview with Joe Soln, 6 March 1985.

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